

Atty. Dkt. No. 2001P14844US

**REMARKS**

Applicant respectfully requests reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow.

Claims 3, 13, and 18 are requested to be cancelled. Claims 1, 2, 4, 10, 15, 21, and 22 are currently being amended. Applicant respectfully requests that Examiner enter the amendments to the claims because there is no new matter and no increase in the number of claims. Furthermore, the amendments to the claims do not necessitate a new search. Claims 1, 2, 4-12, 14-17, and 19-22 are now pending in this application.

**Claims 1, 2, 4-12, 14-17, 19-21, and 22**

Claims 1, 10, 15, and 22 have been amended to include use of the formula " $S_{QPSK}(t) = (\text{real}(S(t)) + \text{imag}(S(t))) * (\text{real}(S(t-1)) - \text{imag}(S(t-1)))$ ", where  $S(t)$  is a DQPSK symbol at time  $t$ , and  $S_{QPSK}(t)$  is a QPSK symbol at time  $t$ ." Claims 3, 13, and 18 previously included this limitation and have been cancelled as indicated above.

On Page 9 of the Office Action, claims 3, 4, 13, 18, and 19 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 5,355,092 (Kosaka2), in view of U.S. Patent 5,369,378 (Kosaka1), and further in view of U.S. Patent 5,313,493 (Dutta). Applicant respectfully traverses this rejection.

Claims 2 and 4-9 depend from claim 1. Amended claim 1 recites

1. A method of modulating or demodulating a communication signal using differential quadrature phase shift keying (DQPSK), the method comprising:

upon receiving an inbound communication signal, demodulating the inbound communication signal by:

...

translating the  $\text{Pi}/4$  DQPSK symbols into quadrature phase shift keying (QPSK) symbols utilizing the formula

$$S_{QPSK}(t) = (\text{real}(S(t)) + \text{imag}(S(t))) * (\text{real}(S(t-1)) - \text{imag}(S(t-1))),$$

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where  $S(t)$  is a DQPSK symbol at time  $t$ , and  $S_{\text{QPSK}}(t)$  is a QPSK symbol at time  $t$ ; and

Amended claims 10, 15, and 22 also include the limitation "translating the  $\pi/4$  DQPSK symbols into quadrature phase shift keying (QPSK) symbols utilizing the formula  $S_{\text{QPSK}}(t) = (\text{real}(S(t)) + \text{imag}(S(t))) * (\text{real}(S(t-1)) - \text{imag}(S(t-1)))$ , where  $S(t)$  is a DQPSK symbol at time  $t$ , and  $S_{\text{QPSK}}(t)$  is a QPSK symbol at time  $t$ ." Claims 11, 12, and 14 depend from claim 10, and claims 16, 17, 19, and 20 depend from claim 15.

Relative to claims 3, 13, and 18, Examiner states:

As to claims 3, 13, and 18, Kosaka2 teaches a method for DQPSK demodulation. Kosaka2 does not teach use of the formula claimed by the applicant in claim 3 in DQPSK demodulation. Dutta teaches translating the  $\pi/4$  DQPSK symbols into QPSK symbols, using the formula  $s'(t) = m(t)m(t-T)\exp[j\{\Delta\omega t - \Delta\omega(t-T)\}]$ . Letting  $s'(t) = S_{\text{QPSK}}(t)$ ,  $m(t) = S(t)$  and  $T=1$ , and using simple calculus, this formula can be equated to the formula claimed by the applicant in claim 3 (see Dutta, column 6 lines 41-45). It would have been obvious to one of ordinary skill in the art to use the formula taught by Dutta in the demodulator taught by Kosaka2, so as to carry out the translation of  $\pi/4$  DQPSK symbols into QPSK symbols.

(Office Action mailed June 21, 2005, pages 9-10, emphasis added).

Examiner recognizes that Kosaka2 fails to disclose, teach, or suggest "translating the  $\pi/4$  DQPSK symbols into quadrature phase shift keying (QPSK) symbols utilizing the formula

$$S_{\text{QPSK}}(t) = (\text{real}(S(t)) + \text{imag}(S(t))) * (\text{real}(S(t-1)) - \text{imag}(S(t-1))),$$

where  $S(t)$  is a DQPSK symbol at time  $t$ , and  $S_{\text{QPSK}}(t)$  is a QPSK symbol at time  $t$ ." Examiner points to Dutta as providing this teaching.

Dutta discloses:

The signal  $s(t)$  is fed to the differential detector 32 which multiplies it with a delayed and complex conjugated version of

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itself from a 1-bit delay element 38, the delay being equal to the known bit period,  $\tau$ . The output of the multiplier is given by:

$$\begin{aligned} s'(t) &= s(t)s(t-\tau)^* \\ &= m(t)m(t-\tau)\exp[j\{\Delta\omega t - \Delta\omega(t-\tau)\}] \\ &= m(t)m(t-\tau)\exp[j(\Delta\omega\tau)] \end{aligned}$$

where, \* denotes a complex conjugate.

(Dutta, Col. 6, lines 35-46, emphasis added). As a result, Dutta describes a conventional modulation scheme that requires a complex multiplication including the term "j".. Examiner states that the formula,  $S_{QPSK}(t) = (\text{real}(S(t)) + \text{imag}(S(t))) * (\text{real}(S(t-1)) - \text{imag}(S(t-1)))$ , can be derived using simple calculus from the equation of Dutta. Applicant respectfully disagrees and asks that Examiner disclose this simple calculus.

First, use of the formula,  $S_{QPSK}(t) = (\text{real}(S(t)) + \text{imag}(S(t))) * (\text{real}(S(t-1)) - \text{imag}(S(t-1)))$ , does not require a complex multiplication as is required in Dutta because the complex number "j" is not required in the formula. Second, if use of simple calculus was obvious for derivation of the formula,  $S_{QPSK}(t) = (\text{real}(S(t)) + \text{imag}(S(t))) * (\text{real}(S(t-1)) - \text{imag}(S(t-1)))$ , as Examiner suggests, Dutta would not describe use of a complex multiplication, which requires additional hardware and/or software to accomplish. Thus, Dutta does not disclose, teach, or suggest "translating the Pi/4 DQPSK symbols into quadrature phase shift keying (QPSK) symbols utilizing the formula

$$S_{QPSK}(t) = (\text{real}(S(t)) + \text{imag}(S(t))) * (\text{real}(S(t-1)) - \text{imag}(S(t-1))),$$

where  $S(t)$  is a DQPSK symbol at time  $t$ , and  $S_{QPSK}(t)$  is a QPSK symbol at time  $t$ ."

For at least the foregoing reasons, neither Kosaka1, Kosaka2, nor Dutta, alone or in combination, disclose, suggest, or teach "utilizing the formula

$$S_{QPSK}(t) = (\text{real}(S(t)) + \text{imag}(S(t))) * (\text{real}(S(t-1)) - \text{imag}(S(t-1)))."$$

where  $S(t)$  is a DQPSK symbol at time  $t$ , and  $S_{QPSK}(t)$  is a QPSK symbol at time  $t$ ."As a result, Kosaka1, Kosaka2, and Dutta fail to disclose, suggest, or teach all of the limitations of claims 1, 10, 15, and 22. An obviousness rejection cannot be properly maintained where the references

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used in the rejection do not disclose all of the recited claim elements. As a result, Applicant respectfully requests withdrawal of the rejection of claims 1, 10, 15, and 22. Applicant respectfully traverses any arguments posed by Examiner relative to claims 2, 4-9, 11, 12, 14, 16, 17, 19, and 20 as they are allowable for at least the reasons outlined above relative to claims 1, 10, 15, and 22. Therefore, Applicant respectfully requests withdrawal of the rejection of claims 1, 2, 4-12, 14-17, 19, 20, and 22.

**Claim 21**

Claim 21 has been amended to include a look up table. Claim 14 includes the look up table of claim 21. Amended Claim 21 recites

21. A method of modulation using differential quadrature phase shift keying (DQPSK), the method comprising:

...

mapping the translated bits to DQPSK symbols using a lookup table wherein the lookup table includes the following values stored therein:

Bit Combination	Real	Imaginary
000	0	1
001	-0.707	0.707
010	-1	0
011	-0.707	-0.707
100	0	-1
101	0.707	-0.707
110	1	0
111	0.707	0.707

On Page 6 of the Office Action, claims 1, 2, 5-12, 14-17, and 20 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Kosaka2, in view of Kosaka1. Applicant respectfully traverses this rejection.

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Relative to Claim 14, Examiner states:

As to claims 6 and 14, Kosaka2 teaches using a look up table to map the QPSK symbols into a pair of bits (see Kosaka2, column 15 lines 58-68, column 16 lines 1-10, and Figures 6 and 22)..

(Office Action mailed June 21, 2005, page 8).

First, claim 21 is directed to a method of modulation. Kosaka2 describes an "apparatus for demodulating an incoming digitally phase modulated analog signal." (Kosaka2, Abstract, emphasis added). Second, Kosaka2 does not disclose, teach, or suggest the look up table of claim 21. Kosaka1 describes a "digital DQPSK modulator" and Fig. 9 of Kosaka1 includes a truth table for performing mapping operations. The truth table of Fig. 9, however, does not disclose, teach, or suggest the look up table of claim 21. The mapping operation of Kosaka1 maps the three bit data to four parameters I1, I0, Q1, and Q0. Claim 21 includes mapping of the three bit data to one real number and one imaginary number. Additionally, the mapped values of Kosaka1 are all either one or zero. Claim 21 includes mapping to values that include  $\pm 0.707$ .

For at least the foregoing reasons, neither Kosaka1 nor Kosaka2, alone or in combination, disclose, teach, or suggest the look up table of claim 21. An obviousness rejection cannot be properly maintained where the references used in the rejection do not disclose all of the recited claim elements. As a result, Applicant respectfully requests withdrawal of the rejection of claim 21.

For the foregoing reasons, it is submitted that all of the claims that have been examined in this application should be in condition for allowance. The amendments to Claims 1, 2, 4, 10, 15, 21, and 22 do not require an additional search by the Examiner because the limitations were previously included in Claims 3, 13, 14, and 18. Similarly, the amendments to Claims 1, 2, 4, 10, 15, 21, and 22 do not raise issues of new matter, increase the number of claims, or otherwise involve new issues.

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Applicant believes that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested. The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-2179.

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SIEMENS CORPORATION  
Customer Number: 28524  
Intellectual Property Department  
170 Wood Avenue South  
Iselin, New Jersey 08830  
ATTENTION: Elsa Keller, IP Department  
Telephone: (732) 321-3026

Respectfully submitted,

By Heather Mueller  
Heather Mueller  
Registration No. 39,033  
Attorney for Applicants  
Tel: 650-943-7405  
Fax: 650-968-4517